CLAIMS:

1. A magnetic resonance method for localizing an interventional instrument (1) on which at least one microcoil (6) is provided, first a magnetic resonance signal being generated in an examination zone by means of an RF pulse (7), said magnetic resonance signal subsequently being detected via the microcoil and under the influence of magnetic field gradients, characterized in that, said RF-pulse (7) is a non-selective RF-pulse and after application of the non-selective RF pulse (7), two or more gradient pulses (8, 10, 11) having a respective linearly independent spatial direction are generated in temporal succession, the position of the microcoil (6) in the relevant spatial direction being determined from the frequency of the magnetic resonance signal during each gradient pulse.

2. A method as claimed in claim 1, characterized in that after the non-selective RF pulse (7) the two or more gradient pulses (8, 10, 11) are applied in temporal succession without intermediate application of further RF pulses.

Sub a1

~~3. A method of imaging blood vessels (angiography) where a catheter (1) which is provided with at least one microcoil (6) for the detection of magnetic resonance signals is inserted into the blood vessel (3) of a patient to be examined, characterized in that the position of the catheter (1) is detected by means of the method claimed in claims 1 or 2 and the intensity of the detected magnetic resonance signal is reproduced as a function of the catheter position.~~

4. A method as claimed in claim 3, characterized in that the spin lattice relaxation rate in the medium (blood) surrounding the microcoil (6) is increased by utilizing a suitable contrast medium.

5. A method as claimed in claim 3, characterized in that the pulse sequence is repeated at such short time intervals that the contributions by the tissue surrounding the blood vessel (3) to the magnetic resonance signal are negligibly small.

6. A method as claimed in claim 3, characterized in that the magnetic resonance signal from the surroundings of the microcoil (6) is spectroscopically analyzed.

7. A method as claimed in claim 3, characterized in that the flow speed of the blood surrounding the microcoil (6) is determined on the basis of the magnetic resonance signal (flow encoding).

8. A method as claimed in claim 3, characterized in that the intensity of the magnetic resonance signal is reproduced in an anatomical survey image of the examination zone as a function of the position of the catheter (1).

Sub a2

~~9. A diagnostic magnetic resonance imaging method for imaging the surroundings of an interventional instrument (1) on which a microcoil is provided for the detection of the magnetic resonance signals, characterized in that a localization method, particularly as claimed in any one of claims 1 or 2, is applied alternately with a sequence of RF pulses and gradient pulses that is intended for the imaging, the parameters of the imaging sequence that determine the volume to be imaged (field of view or FOV) being predetermined by the position of the interventional instrument (1) determined by means of the localization method, so that an image is formed of the surroundings of the interventional instrument.~~

a2

10. A method as claimed in claim 9, characterized in that the volume of the FOV is chosen to be slightly larger than the spatial sensitivity range of the microcoil.

11. A method as claimed in claim 9, characterized in that an EVI sequence (echo voluminar imaging) is used for the imaging.

12. A method as claimed in claim 9, characterized in that the image of the surroundings of the interventional instrument is superposed on an anatomical survey image of the examination zone.

13. A method as claimed in claim 9, characterized in that magnetic resonance signals acquired in different positions are combined so as to form one image of the surroundings of the interventional instrument (1).

14. A method as claimed in claim 9, characterized in that the FOV of the imaging sequence is chosen to be smaller than the spatial sensitivity zone of the microcoil (6), so that image artefacts that are caused by aliasing effects are eliminated by combination of the magnetic resonance signals successively acquired in different positions while taking into account the spatial sensitivity profile of the microcoil (6).

15. A method as claimed in claim 9, characterized in that the succession of the localization sequence and the imaging sequence is extended with a further imaging sequence whose FOV is also situated in the vicinity of the interventional instrument (1) and during which the magnetic resonance signals are detected by an external volume coil or surface coil, the spatial sensitivity profile of the microcoil (6) then being determined by comparison of the data acquired by the microcoil (6) and the data of the external coil.

Sub a3

~~16. A magnetic resonance system for carrying out the method claimed in claims 1 or 2, which system includes at least one coil (17) for generating a uniform, steady magnetic field, a number of gradient coils (18, 19, 20) for generating gradient pulses in different spatial directions, an RF transmission coil (21) for generating RF pulses, at least one control unit (24) for controlling the temporal succession of RF pulses and gradient pulses, a reconstruction unit (25) and a visualization unit (26), and an interventional instrument (1) with at least one microcoil (6) which is connected to a receiving unit (27), characterized in that the control unit (23) is used to generate, via the RF transmission coil (21), non-selective RF pulses (7) and, via the gradient coils, two or more gradient pulses (8, 10, 11) with respective linearly independent spatial directions, the magnetic resonance signals detected by the microcoil (6) being received via the receiving unit (27), in order to calculate therefrom, by means of the reconstruction unit (25), the position of the interventional instrument (1) that can be displayed by means of the visualization unit (26).~~

17. A magnetic resonance system as claimed in claim 16, characterized in that the control unit (23) is also capable of generating an imaging sequence whose FOV can always be automatically adjusted to the area of the position of the interventional instrument (1).

18. A magnetic resonance system as claimed in claim 17, characterized in that the reconstruction unit (24) is used during the imaging to combine the magnetic resonance

signals sequentially acquired in different positions of the interventional instrument (1) while taking into account the spatial sensitivity profile of the microcoil (6) so as to form an image of the surroundings of the interventional instrument 1 that can be displayed by means of the visualization unit (25).

19. A magnetic resonance system as claimed in claim 16, characterized in that it includes at least one additional external volume coil or surface coil which serves to receive magnetic resonance signals during the formation of anatomical survey images that are displayed, together with the position determined for the interventional instrument (1), by means of the visualization unit (26).

20. A computer program product for a magnetic resonance system as claimed in claim 16, characterized in that the computer program determines the spectrum of the magnetic resonance signals detected by the microcoil and calculates therefrom, and on the basis of the gradient pulses used, the position of the interventional instrument for display by means of the visualization unit.

21. A computer program product as claimed in claim 20, characterized in that the parameters of an imaging sequence that determine the FOV are calculated from the position data determined.